Chapter VI – Network Comparisons

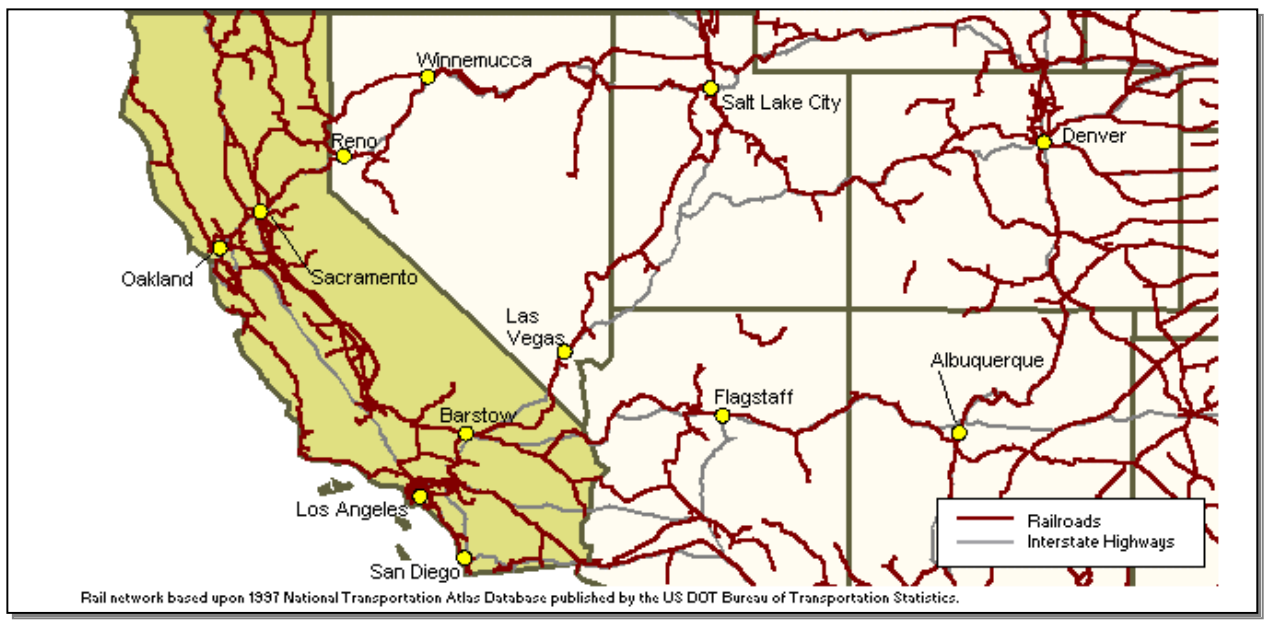
Rail Network Overview

- The regional rail network has reserve capacity for traffic that might be diverted from the highway.
  - High Capacity Lines: The major main lines serving the SCAG region are high-capacity routes with reserve capacity, although prioritization will be necessary.
  - Resources for Improvements: When traffic has grown, railroads have typically invested in higher capacity to handle it.
  - Transloading Options: The growth of transloading options and attendant logistics practices creates additional rail opportunities.
- There are a few serious limitations on the ability of the rail network to expand service.
  - Geography: Rail lines use mountain passes with steep grades and limited right-of-way.
  - Regional Network Age: The rail network pre-dates most of the regional industrial expansion, and can be adapted or extended only with great difficulty.
  - Regional Network Reductions: While many main lines and branches are still in place, others have been sold for passenger service or dismantled
  - Passenger Service Conflicts: The greatly expanded scope of regional rail passenger service limits the "windows" available for additional freight service.

California Rail Infrastructure

- The SCAG Region rail network is part of a larger California, national, and North American network
- The major routes run generally eastward from Los Angeles, including the ports, to the San Bernardino area. From here one major route goes north to the Bay area, another runs to the east, ultimately to Chicago and the east coast, and a third runs via El Paso to the East and Southeast. All of these lines are high capacity lines and have significant grades both in and out of the region. The map below shows how the major Southern California routes are linked to the state and national networks.

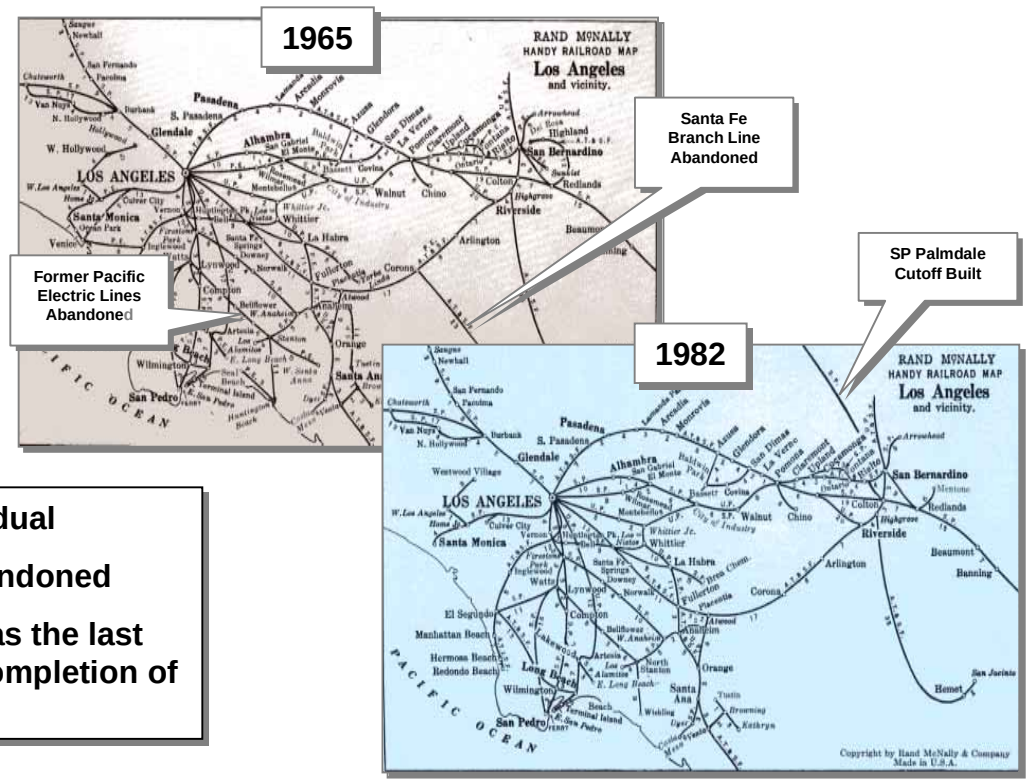
Exhibit 75: SCAG Rail Network Connections



Regional Rail Network Changes

- Regional Network Age: The rail network pre-dates most of the regional industrial expansion, and can be adapted or extended only with great difficulty. Exhibit 5 compares the 1965 and 1982 networks.
- Regional Network Reductions: While many main lines and branches are still in place, others have been sold for passenger service or dismantled .

Exhibit 76: Regional Rail Network Changes



Changes have been gradual

Old lines have been abandoned

SP's Palmdale Cutoff was the last major addition before completion of the Alameda Corridor

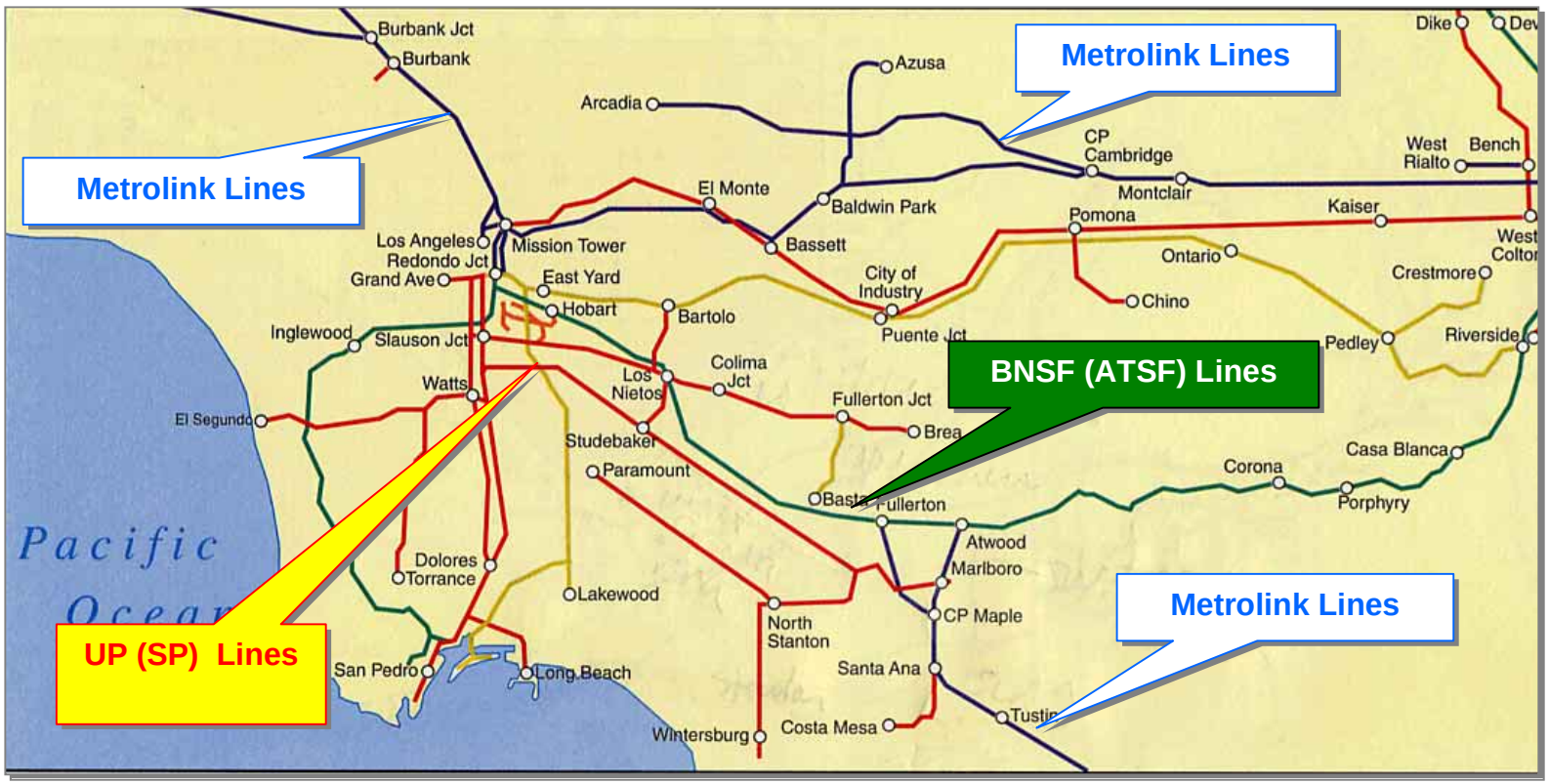
Current SCAG Region Rail Network

Several lines are controlled and heavily used by Metrolink.

Many branch lines have been truncated.

Other branch lines abandoned or no longer served.

Exhibit 77: SCAG Regional Rail Network



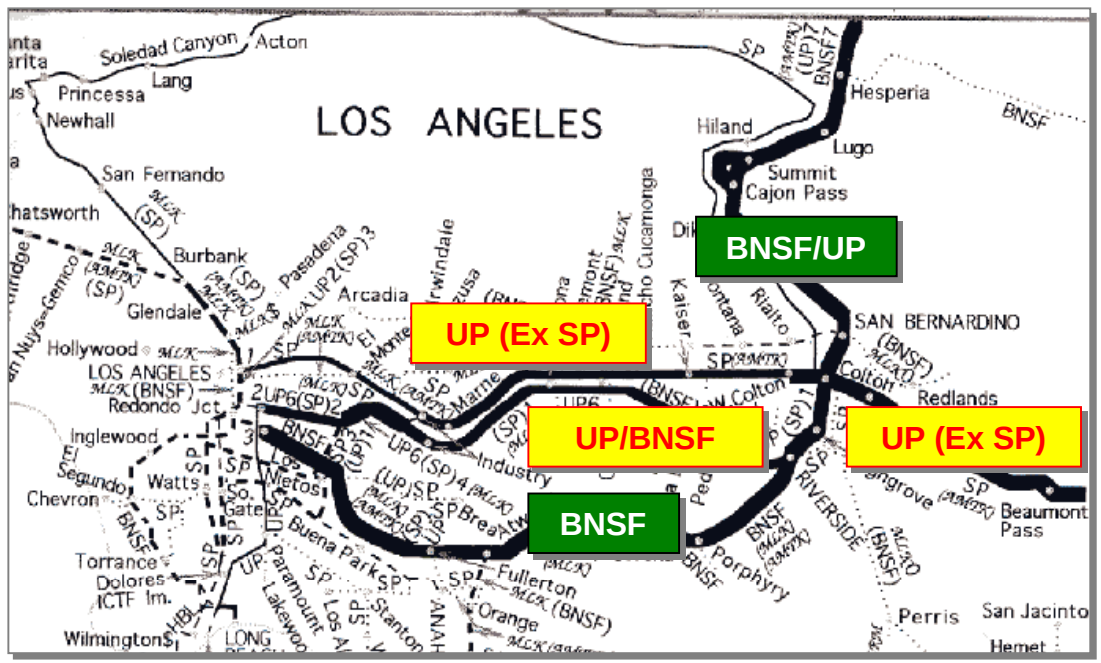
BNSF and UP Corridors

- There are five rail corridors connecting the SCAG region with the rest of the nation:
  - UP's Coast Line north through Ventura County to the Bay Area (former SP route)
  - UP's Saugus Line via Burbank and Palmdale, connecting with UP's Central Valley lines at Mojave (former SP route)
  - UP's Palmdale Cutoff between Palmdale and West Colton, allowing UP's long-distance traffic to bypass the Los Angeles Basin (former SP route)
  - UP's mainline from Los Angeles via Colton and Beaumont Pass to Yuma and points east (former SP route)
  - BNSF's line through Cajon Pass to Barstow and points east (former ATSF route), which also carries UP's traffic via trackage rights

Railroad Line Density

- The freight railroads carry three major types of traffic:
  - Unit trains of bulk commodities. These consist of complete trains of a single commodity such as coal or grain in a regular movement between a fixed origin and a fixed destination.
  - Intermodal trains. These consist of conventional, spine, or double-stack cars carrying intermodal trailers and/or containers between intermodal facilities or on-dock port facilities.
  - Carload freight trains. These are the common freight trains whose consist of cars is mixed in both type and commodity and which changes from day to day.
- A few major main lines carry most of the traffic

Exhibit 78: Railroad Line Density



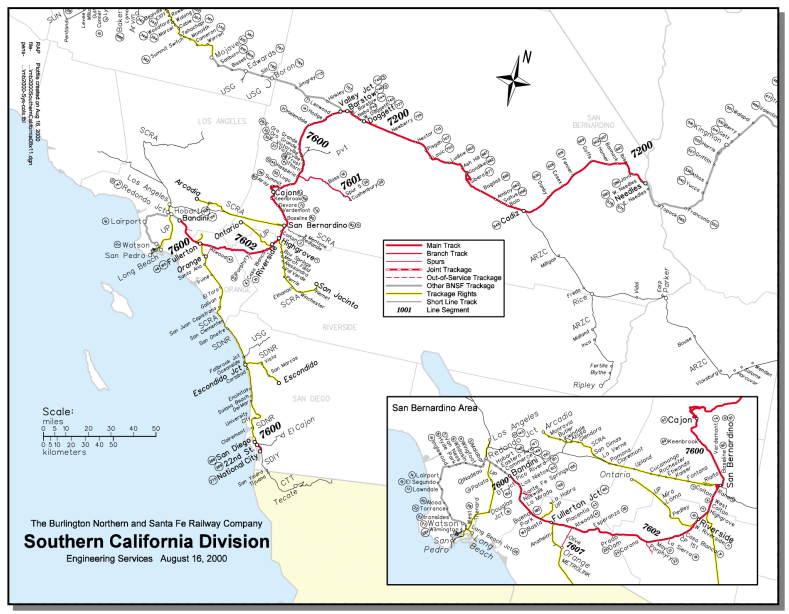
Rail Facilities

- The freight railroads have several types of facilities in the SCAG region:
  - trackage and right-of-way, including line-haul routes to, from, and through the region, and a network of local trackage serving industrial customers
  - classification yards, where line-haul trains are made up and broken down, freight cars are classified into groups, and local trains arrive and depart
  - local or industrial yards, serving similar functions as classification yards but on a smaller scale
  - intermodal facilities ("piggyback ramps"), where intermodal trailers and containers are loaded and unloaded from trains, and interchanged with motor carriers
  - auto-loading facilities ("auto ramps") where automobiles and light trucks are loaded and unloaded from specialized freight cars
  - transload facilities where bulk or other commodities are transferred between freight cars and trucks, and may also be stored or processed (most are privately owned and operated)
  - maintenance facilities, where locomotives and freight cars are serviced and maintained, and light repairs are made (none of the railroads have major shops for heavy repairs in the SCAG region)

BNSF Network

- Burlington Northern Santa Fe, headquartered in Fort Worth, TX, is one of the six major North American railroads. It serves 28 states and two Canadian provinces with some 33,500 miles of track.
- The Southern California Division is headquartered in San Bernardino; its territory extending from Needles to Redondo Junction in Los Angeles, a distance of about 320 miles. It is comprised of three mainline subdivisions, and several lines either owned, such as the Hesperia branch or the San Diego line where BNSF provides freight service. The map below shows this operating division.

Exhibit 79: BNSF Regional Network



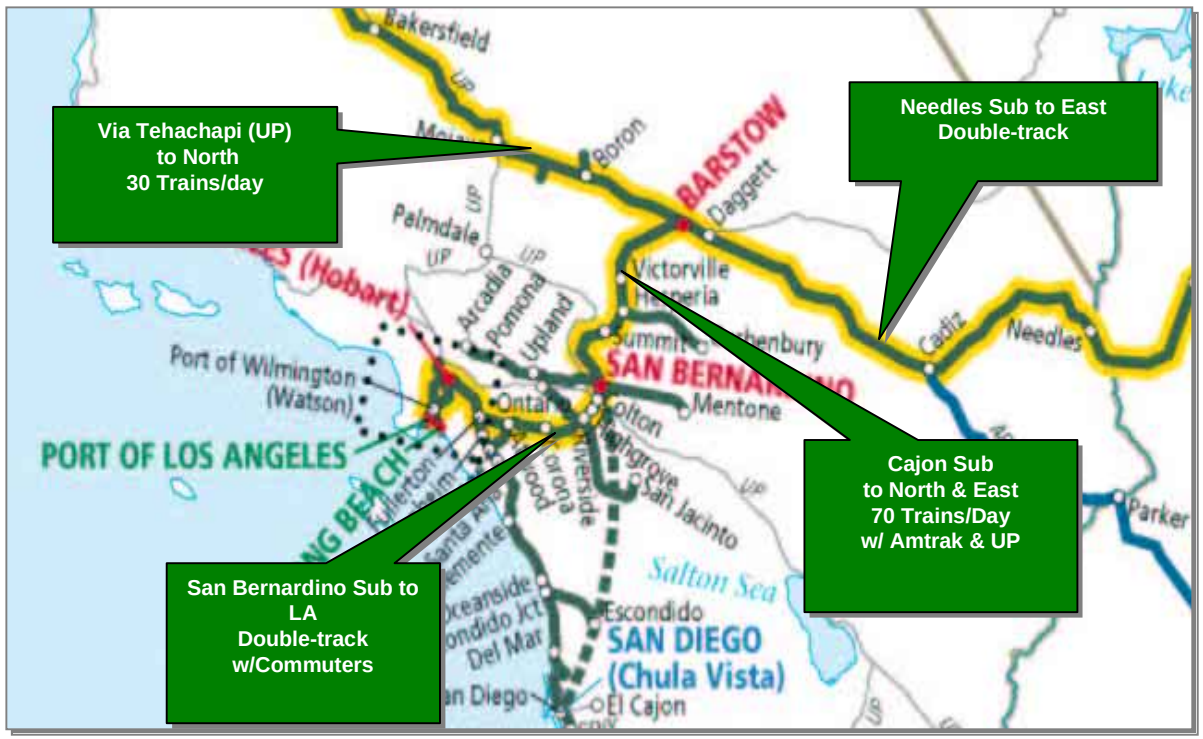
BNSF Facilities

- BNSF maintains major facilities in the SCAG region, including:
  - Intermodal facilities in Commerce (Hobart) and San Bernardino
  - Rail-truck transload and warehousing facilities (Quality Distribution Centers, associated or owned) in Bakersfield, Glendale, Fontana, Pomona, Los Angeles, Long Beach, Wilmington, and Commerce
  - A major freight classification yard in Barstow
- BNSF employs about 1500 people in the SCAG region.
- The BNSF operation in Southern California is under the control of two divisions, the Southern California Division and the Los Angeles Terminal Division.

BNSF Southern California Subdivisions

- BNSF's Southern California Division is divided into three subdivisions, shown below and described on the next pages

Exhibit 80: BNSF Subdivisions



BNSF Southern California Subdivisions

Needles Subdivision

This subdivision extends 168 miles from Needles to Barstow. It is a double tracked, high capacity line with fairly heavy grades both east and westbound. Westbound grades of 1.4% extend 30 miles from Needles to Goffs, and from approximately Amboy, MP 66o, to Ash Hill, about 28 miles at maximum 1.42%. Grades notwithstanding, freight train maximum speeds for much of the distance are 55 mph. Eastbound, the major grade extents 42 miles from MP 660 to Goffs, with a maximum gradient of 1.28%.

Cajon Subdivision

This subdivision extends 81 miles from Barstow to San Bernardino. It is also a double tracked railroad with very heavy grades both east and west. It is also host to UPRR trackage rights on the entire route, adding to train volume. (The UP trackage rights continue east from Barstow a short distance to Daggett on the Needles sub, where UP's own line continues on to Salt Lake).

The westbound grade extends all the way from Barstow, 56 miles, with the heaviest portion of the grade from approximately Frost, MP38 to Summit, at 1.6%. the eastbound grade is significantly more severe at 2.2% much of the distance (22 of 26 miles) from summit to San Bernardino. Most trains require helper or pusher engines to surmount the grade. Many westbound trains also require assistance. When these helper units are cut off (removed) from the train and return to their starting points (to help another train), this adds additional moves to the traffic on the line. About 90 to 95 trains are operated over this route on a daily basis, including 20-22 UP trains and a couple of Amtrak trains.

BNSF Southern California Subdivisions

San Bernardino Subdivision

- This is BNSF's main line between Barstow and Los Angeles. The line extends from San Bernardino to Redondo Junction in LA where it connects with the LA Terminal Division a distance of 68 miles. This railroad is also double tracked and with much of the distance having a 50 MPH speed limit. Westbound is down, approximately 800' elevation decrease. Eastbound is mostly 1.0% grade with several segments of slightly greater gradient. East of San Bernardino a number of passenger trains operate but not on the freight line. However, from Fullerton to LA, about 20 miles a large number of passenger trains operate on the freight line adding to the complexity of operations, as these trains make many station stops, interfering with the freight trains.
- This is a heavily used, high-speed line with numerous train operations daily in both directions. The heaviest single traffic source may be intermodal (piggyback and container) traffic to and from BNSF's Hobart intermodal terminal on Washington Boulevard in the City of Commerce and the Port of Long Beach.
- Traffic on this line will be affected by long-term goods movement growth in Southern California, including any impact of the Alameda Corridor and increased traffic due to NAFTA. (BNSF connects with Mexican railroads at Calexico and points east.)

- BNSF also operates a significant number of trains via the UP's (former SP) Mohave Subdivision. This route provides BNSF with access to northern California. BNSF trains operate from Barstow to Mohave on their own trackage, thence north via trackage on UP over the Tehachapi grade. Much of this line is single tracked. About 30 trains operate on this route daily.

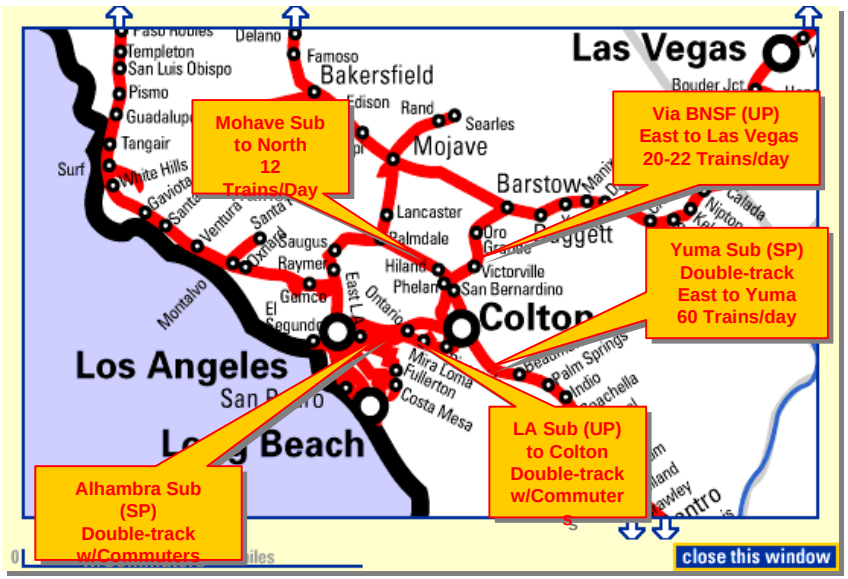
BNSF Los Angeles Terminal Division

- This Division and its principal operating component, the Harbor Subdivision, extends in a somewhat roundabout way some 28 miles between Redondo Junction in downtown LA to West Thenard, where connection is made with the Pacific Harbor Line. This line is essentially flat, single track with many grade crossings and corresponding speed restrictions. Maximum speed is 20 MPH, with much of the line lower than that. Nonetheless all of BNSF's port traffic moves via this line. With completion of the Alameda Corridor, this line will likely no longer be retained as a through route, but only to serve industrial customers.

Union Pacific Network

- Union Pacific, headquartered in Omaha, is currently the largest railroad in the western United States. The UP system covers roughly 38,6500 actual miles of track. UP's network in the SCAG Region incorporates the original UP routes as well as the former Southern Pacific network. From the SCAG region, UP's original route extends northwest to Salt Lake City, (Ogden) where it joins routes from the Bay Area and the Pacific Northwest. UP's extremely busy east-west route connects Utah with Omaha and Kansas City, where a network of lines extends to Chicago, St Louis, Memphis, and points south. UP has a major connection to Mexico at Laredo.

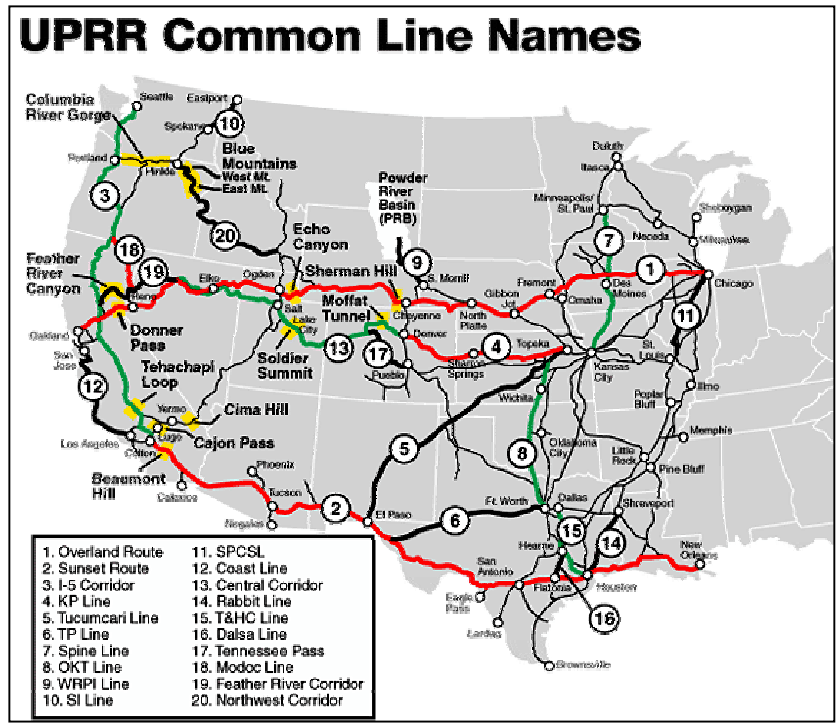
Exhibit 81: UP Regional Network



UP Route Structure

- Former Southern Pacific routes now part of Union Pacific include:
  - the “Central Corridor” over Donner Pass connects Northern California with points east through Salt Lake City, Denver, and Kansas City
  - the “I-5 Corridor” connects the SCAG region with northern California and Oregon
  - the “Golden State Route” connects the SCAG region with southwestern and Midwest states via El Paso and Kansas City
  - the “Sunset Route” connects the SCAG region with Texas and Louisiana via El Paso, Houston, and New Orleans
  - the “Mid-America” corridor runs north-south between Houston and Chicago via St Louis.
- SP also had several connections to Mexico which are now part of UP.

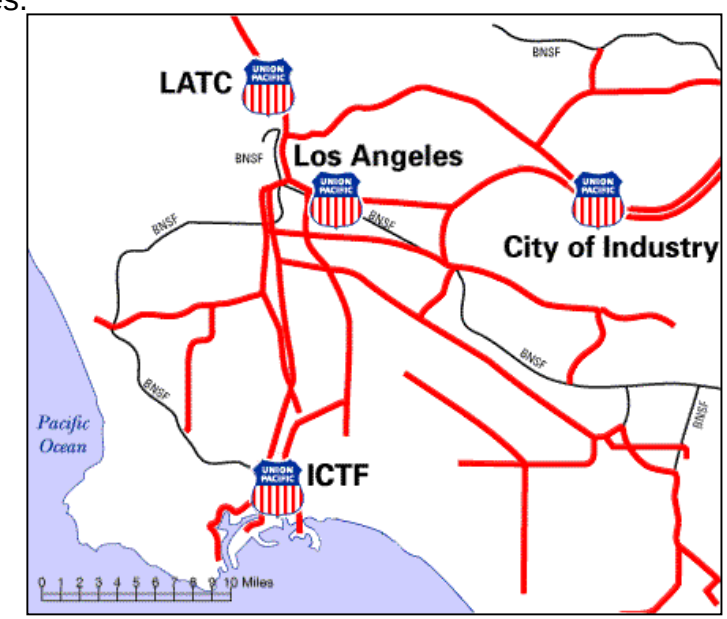
Exhibit 82: UP Route Structure



UP Trackage and Facilities

- UP's SCAG-area trackage system has been altered through sales to local transit agencies and sale of the Alameda Corridor trackage. SP previously listed several other local branches or industrial spurs as subject to eventual abandonment, including the Santa Paula Branch, Canoga Park to Tarzana, portions of the Burbank, Baldwin Park, and Santa Monica Branches, the State Street Line, and a portion of the San Bernardino Branch.
- UP's facilities in the SCAG region now include:
  - Intermodal facilities in Los Angeles (LATC) and Long Beach (ICTF)
  - A major intermodal facility at City of Industry
  - A major freight classification yard in East Los Angeles.
  - A major freight classification yard at West Colton

Exhibit 83: UP Trackage and Facilities



UP Operations

- The UP's operation in southern California is organized into a number of subdivisions, the most important of which will be addressed. These are made up of parts of both the UP and the former SP.
  - *Los Angeles Subdivision* This line extends from Yermo, near Riverside and the junction with BNSF, west to the East LA area, a distance of 60 miles. This is double tracked high speed railroad. Most UP trains from the ports operate via this route. In addition a number of commuter trains operate on this line into LA.
  - *Yuma subdivision* This is the former SP mainline to the east ("East Line"), and extends approximately 202 miles from West Colton, near San Bernardino, to Yuma. The portion in the LA basin that is of importance here is the segment from West Colton to Beaumont, about 37 miles. There are about 60 train moves a day on this double tracked railroad, plus anywhere from 6 to 12 helper locomotive moves.
  - *Alhambra Subdivision* This is the former SP's main entry into LA, extending west from West Colton. A number of commuter trains plus Amtrak operate on this line as well.
  - *Mohave subdivision* This line extends northward from West Colton up through the Cajon Pass, paralleling the BNSF line much of the way to Summit where it continues northward to Mohave, thence over the Tehachapi grades to Bakersfield. Approximately 12 trains a day operate via this route. In addition, from Mohave north about 30 BNSF trains operate on this line.
  - *Los Nietos Subdivision.* This important unit provides access to the port area, via connection with the PHL. A large number of industrial tracks are served by this subdivision.

Short Lines

- The short lines active in the SCAG Region are:
  - Pacific Harbor Line, a subsidiary of Anacostia and Pacific, which handles the switching and dispatch into and out of the Ports of Long Beach and Los Angeles
  - Los Angeles Junction Railway, a subsidiary of the BNSF and managed as part of the BNSF system, which provides switching services in the Vernon area for both BNSF and UP
  - Ventura County Railroad, owned by Rail American Inc,. which switches Port Hueneme and provides a short line connection to the UP
  - The San Jacinto Branch Line, a Riverside County-controlled line connecting industries between Riverside and Hemet to the BNSF and operated by BNSF
- These railroads perform specific local functions, and connect with the trunk-line railroads for movements to and from the SCAG region. In essence, they serve as feeder lines.
- There are numerous industrial switching operations serving individual plants. As these do not provide common carrier freight transportation, they are not covered by this study.

Pacific Harbor Line

- Pacific Harbor Line (PHL) is the successor to previous “belt line” switching operations in the San Pedro and Long Beach areas. PHL provides access to the Ports of Los Angeles and Long Beach, and serves numerous carload customers and transloading facilities in the vicinity. With the exception of one UP yard, all service in the port area is provided by PHL. This includes BNSF and UP trains operating under PHL control to the numerous on-dock rail intermodal facilities. PHL interchanges with BNSF and UP at West Thenard, and with UP at Manuel Yard.

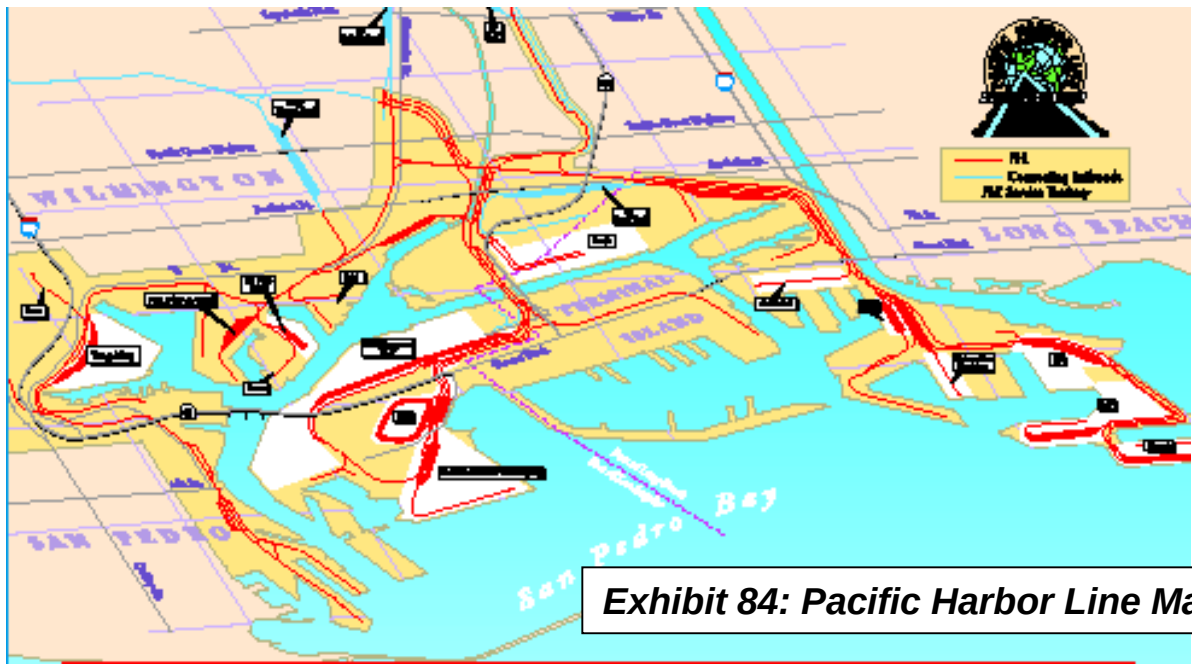


Exhibit 84: Pacific Harbor Line Map

Pacific Harbor Line Operations

PHL consists of five subdivisions all operating within the port areas and the City of Wilmington. PHL has about 75 employees and operates about 40 miles of track (actually owned by the ports).

PHL currently moves about 30,000 carloads of freight annually and dispatches and controls about 20 intermodal trains per day. The vast majority of trains operated by PHL are intermodal (container) trains but there are other trains as well: automobile, coal, and merchandise

Because of the high number of trains operated and consequent congestion maximum track speed is 10 MPH. In part this is a result of BNSF and UP congestion on their own lines into the area. It is anticipated that when operation commences on the Alameda Corridor, PHL will be able to increase train speeds to 25 MPH.

PHL operates its own locomotive fleet to provide service within the port area, with close to one hundred switching assignments operating each week. These provide, for example, ancillary switching services at the various container terminals such as assembling and blocking trains.

Pacific Harbor Line Traffic

- Conceptually, PHL's operations can be divided into three parts:
  - Intermodal service to and from marine container terminals
  - Carload service to and from other port facilities
  - Carload service to and from non-port customers on PHL lines
- Port Container Traffic
  - PHL serves all marine terminals, many of which have on-dock rail intermodal capabilities.
  - In recent years significant capital has been invested in the various container terminals and rail infrastructure. This has included construction of large staging yards as well as removing the PHL access trackage so as not to require passing through one terminal to access another, with the delays and complications that entails.
- Non-container Port Traffic
  - The ports have extensive rail served facilities for handling bulk commodities, with an annual throughput capacity of in excess of 15 million tons (although in recent years actual tonnage has been considerably less).
  - Non-container port facilities include:
    - Autos: Auto Warehousing (Honda), Lexus, Distribution Auto Service (Nissan)
    - Cotton: Prime West, Crescent Warehouse , California Cartage
  - Any significant growth in this traffic would have an impact on rail transportation; each million tons represents approximately 200 train movements (loaded train in, empty out for exports, and the reverse for imports).

PHL Non-port and transload traffic

- Non-port customers on PHL lines include:
  - Refineries such as Tosco and Equilon
  - Carload customers such as Genstar Roofing Materials, DiCarlo bakery, Union Ice, Heinz Pet Food, etc.
  - Transloading facilities such as the Avalon Team Track, California Cartage Company, and San Pedro Forklift
  - Bulk transfer facilities such as Pak tank, Amerigas, Pacific Coast Recycling, Baker Commodities
- PHL is a critical resource for the potential growth of truck-rail transloading, as explained in greater depth in the diversion analysis PHL has rail transfer facilities in Wilmington (shown below) and serves multiple public warehouse and bulk transfer facilities.

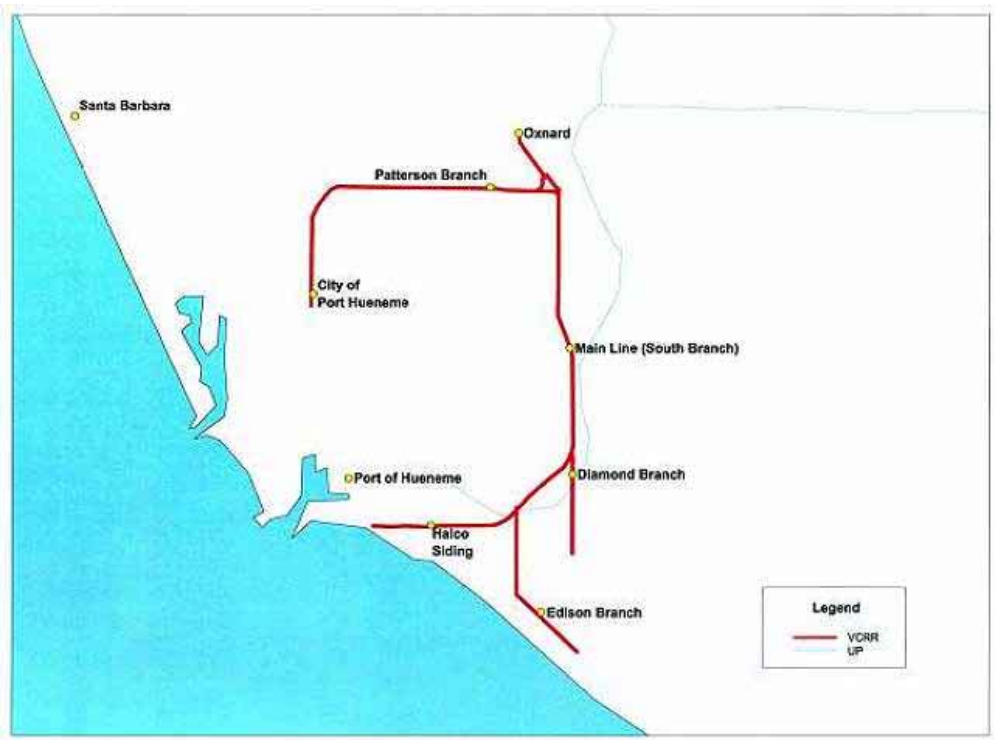
Los Angeles Junction Railway Company

- The Los Angeles Junction Railway Company is owned by BNSF and offers neutral switching to customers in the Los Angeles industrial area with connections to BNSF and UP. It maintains an office in Vernon. It operates approximately 63 miles of trackage with a fleet of four locomotives and 48 employees.
- Like PHL, the Los Angeles Junction Railway is a potential asset to the region for encouraging rail-truck transfers and transloading

Ventura County Railroad

- The Ventura County Railroad (VCRR), operated by Rail America, Inc., connects Port Hueneme with the Union Pacific line at Oxnard. (Below) It also serves industrial customers over approximately 13 miles of track, and maintains offices in Port Hueneme. VCRR moves about 3,100 annual carloads of finished automobiles, chemicals, plastics, and paper products.

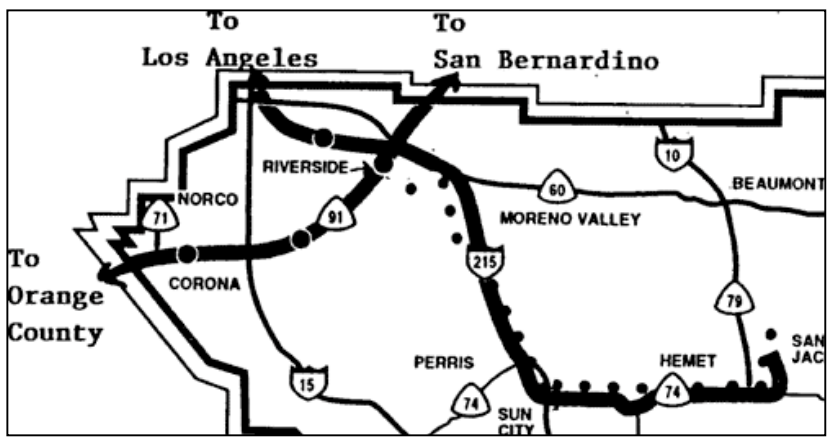
Exhibit 85: Ventura Co. Railroad



San Jacinto Branch Line

- The San Jacinto Branch Line is currently an active freight-only line between Riverside and Hemet, roughly following I-215 and SR 74 (below).
- The line is owned by Riverside County and administered by the Riverside County Transportation Commission (RCTC). RCTC purchased the route from the ATSF in 1992 using local and state bond funds. ATSF retained freight operating rights. Its successor railroad, Burlington Northern Santa Fe, continues to operate freight service and maintain the line under agreements with RCTC.
- The line between Riverside and Hemet/San Jacinto was reportedly considered in the original planning for Metrolink. Lack of funding until recently prevented upgrades to the branch line and it is now reportedly only suitable for slow-speed freight service.
- RCTC is proposing to implement rail passenger service on the entire 38-mile line between the communities of Riverside/Highgrove and San Jacinto. The proposed project is included in the 2001 Regional Transportation Plan. Upgrading the line for passenger service may encourage additional freight traffic or may lead to complete cessation of freight activity.

Exhibit 86: San Jacinto Branch Line



Intermodal Facilities

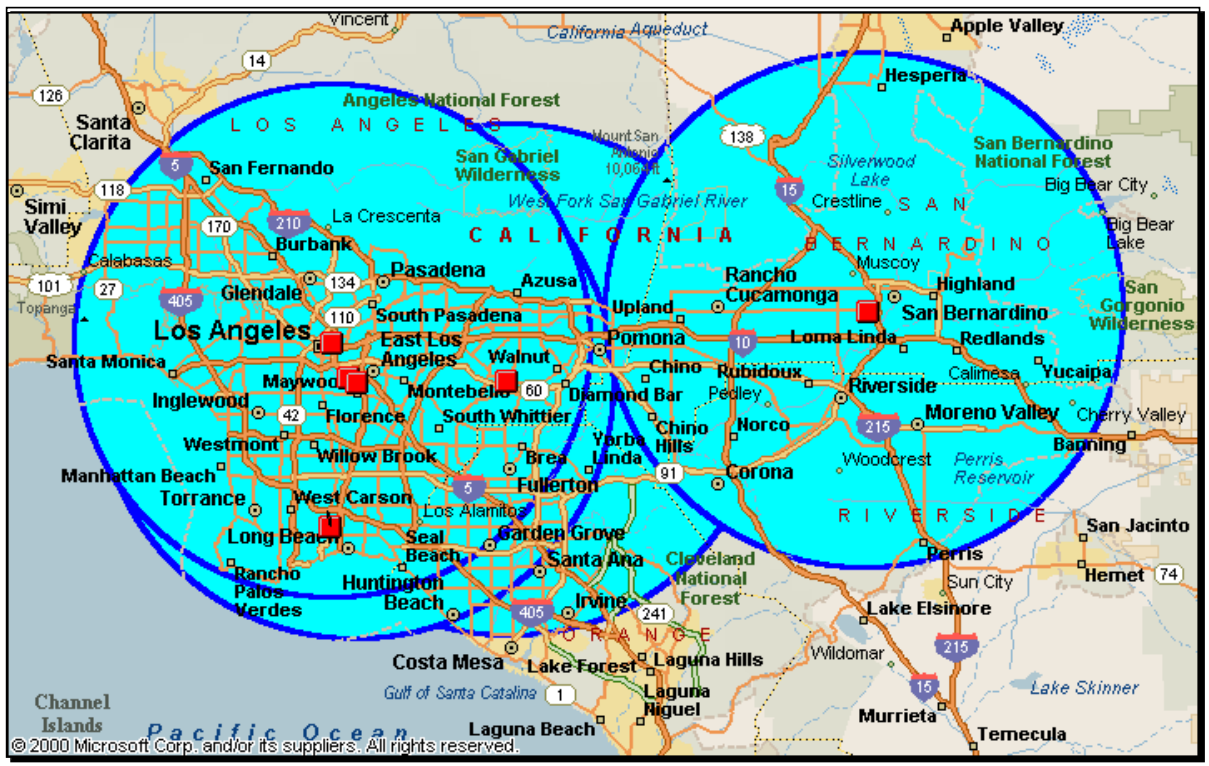
- Intermodal terminals are critical to the success of intermodal services. Terminals are the starting and ending points for trains, and the sites of crucial hand-offs between modes. Terminals also function as equipment storage, maintenance, and dispatching centers, and focal points for the flow of information. Terminals vary widely in configuration, capacity, and operations, and only a few have been built from the ground up as modern intermodal facilities.The map below shows the locations of rail intermodal facilities in the study region.

Exhibit 87: SCAG Region Intermodal Facilities

Intermodal Terminal Coverage

- Since trailers or containers must be trucked to and from intermodal facilities, their location relative to shippers and receivers is a major consideration. The map below shows the coverage of existing intermodal facilities within a 25-mile trucking radius. As the map shows, virtually all of the study area is within 25 miles of an intermodal terminal.

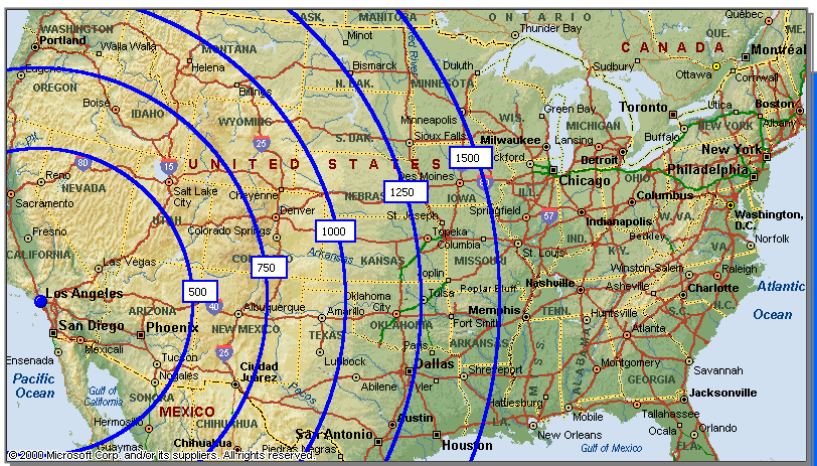
Exhibit 88: Intermodal Terminal Coverage

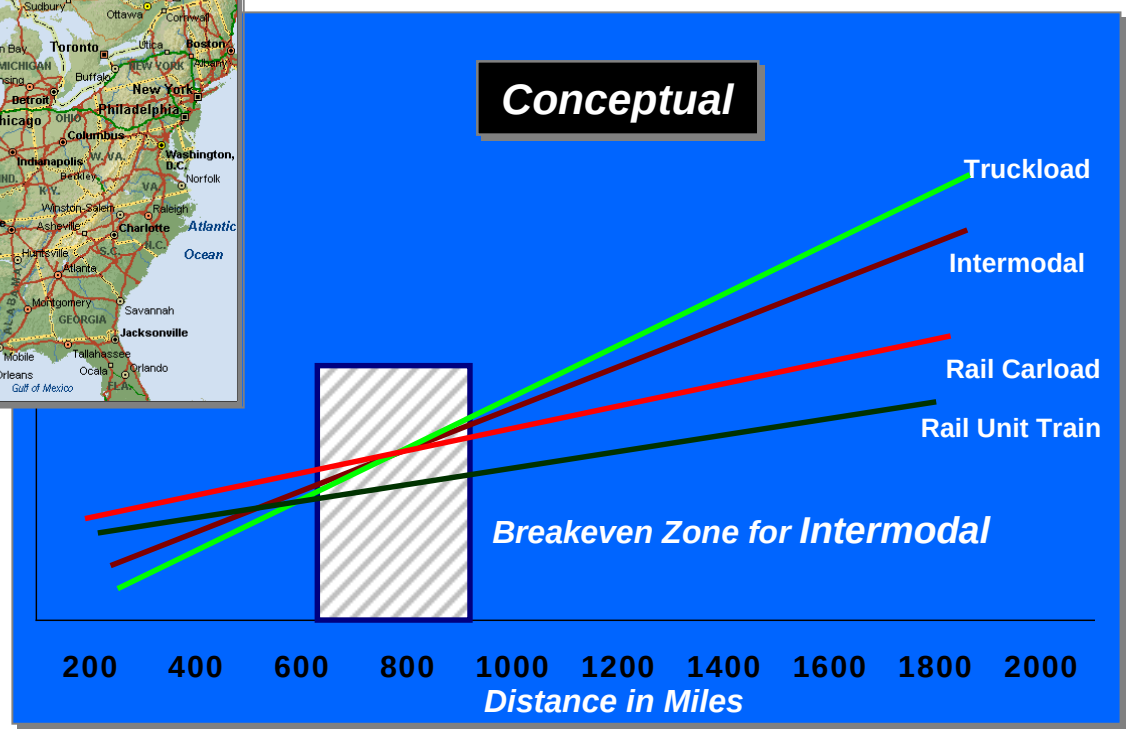


Intermodal Market Distances

- Typical “breakeven” mileage for intermodal is 600-900 miles.
- Reducing the “breakeven” distance from Southern California does not gain access to any large markets unless service can be competitive at about 200 mile or under for intra-state moves.

Exhibit 89: Intermodal Market Distances





Passenger Rail Conflicts

- The SCAG region is also served by Amtrak and Metrolink, providing intercity and commuter rail passenger service, respectively. Amtrak uses the lines of the major railroads, and Los Angeles Union Passenger Terminal. Metrolink primarily uses a network of local lines purchased from the freight railroads, with other routes shared.
- The greatly expanded scope of regional rail passenger service limits the "windows" available for additional freight service
- Recent, rapid expansion of regional rail passenger service has pre-empted use of existing branch lines and main lines.
  - Metrolink now runs 128 trains per day covering 49 stations on six routes
  - Amtrak runs about 26 trains per day on three routes
  - BNSF and UP have limited access for freight trains and industrial switching.
- The combination of frequent stops and high running speeds for regional passenger service is not compatible with efficient, high capacity freight operations or industrial access.

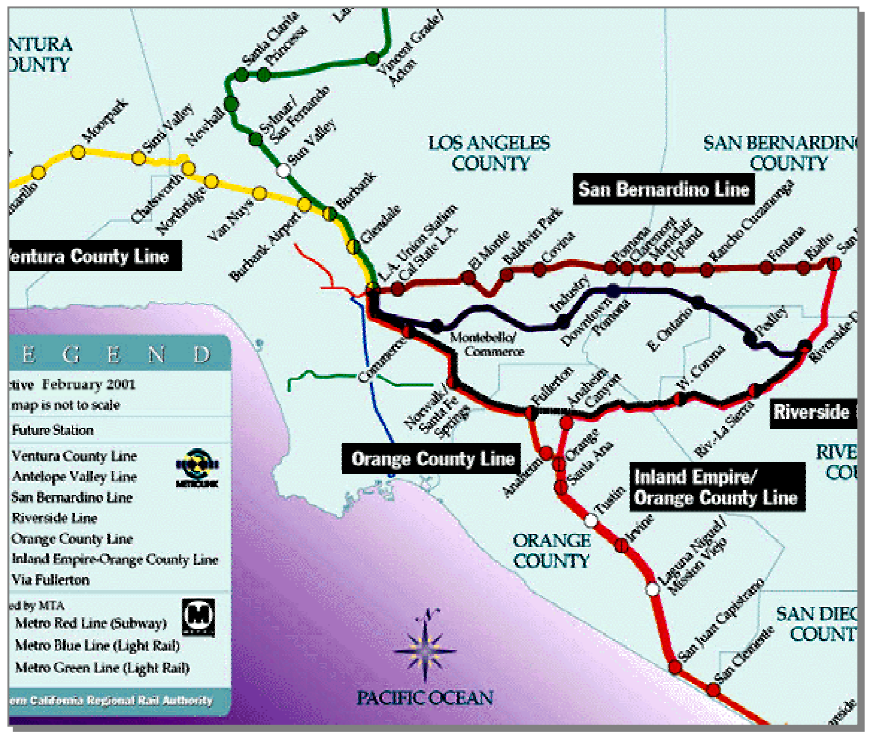
Commuter Rail

- The current regional commuter rail operation dates approximately from 1990, when the California Legislature passed legislation requiring preparation of a plan for regional transit service. The following year a plan was developed which called for a 412 mile, five county, seven route system. To accomplish this, the counties of Los Angeles, Orange, Riverside, San Bernardino and Ventura established a Joint Powers Authority, the Southern California Regional Rail Authority (SCRRA), to design, construct and manage the Metrolink system.
- In the ensuing years, SCRRA acquired several then-SP lines, as well as eventually several miles of UP trackage, in addition to acquiring trackage rights on some 57 miles of UP lines. Other routes on the former ATSF were also acquired either in the form of purchase or trackage rights. This ultimately encompassed a total of about 340 miles, including the Santa Fe line between Fullerton Junction and San Diego. This line was purchased jointly with the North San Diego County Transit Development Board.

Metrolink Operations

- Metrolink commenced service on three former SP lines in October 1992. Initial service was limited to morning and evening commuter service. Service expansion continued to the point that by mid-1998 the daily passenger count was nearly 26,000 on 107 trips over a 416 route mile system.
- Metrolink has continued to expand service and as of September 2001 is operating 128 daily trips, plus 22 Amtrak trips. Daily passenger trips average 33,000. Most service is designed for people working in downtown Los Angeles, where service terminates at Los Angeles Union Station (Los Angeles Union Passenger Terminal, or LAUPT), at which point connection can be made to the extensive light rail system.

Exhibit 90: Metrolink Lines



Metrolink Operations

- SCRRA has contracted out its train operations, with Amtrak being responsible for operations and dispatching. Maintenance and other servicing functions have been contracted to other firms.
- SCRRA is experiencing both line and terminal capacity problems:
  - Plans are currently proceeding to construct third and fourth main tracks on the heavily used BNSF main line between the LAUPT access connection and Fullerton Junction, with an expected completion date in early 2003. This will reduce conflicts with the freight operations and allow additional train service and station stops. There are operational issues to be worked out with BNSF.
  - A recently completed connection at the south end of the LAUPT access line has eased train movements at that location. This construction is associated with the Alameda Corridor project.
- The other capacity issue is with LAUPT itself. The terminal is approaching capacity, and possible solutions are being studied. A partial solution will be improving track access to the terminal from the south, however the major problem will be to increase trackage in the terminal itself.
- Metrolink (SCAX) Orange and Olive Subdivisions
  - These are former Santa Fe lines connecting BNSF's San Bernardino Subdivision with San Diego. In Orange county they form a "Y" shape, connecting to BNSF at Fullerton and Atwood, joining at Control Point Maple (CP Maple), and running south to the county line near San Clemente before continuing to San Diego. This line is heavily used by Metrolink and Amtrak for passenger service, and more lightly used by BNSF for freight.
  - Freight traffic on this line is unlikely to be affected by the Alameda Corridor. San Pedro Bay port traffic will not ordinarily use this line, and this line does not connect to the Mexican railroads. San Diego is a satellite intermodal terminal for BNSF, served by highway from Los Angeles rather than by rail.

Amtrak

- Amtrak (officially the National Rail Passenger Corp.) operates an average of about 26 passenger trains daily in the SCAG Region:
  - Daily Coast Starlights northbound and southbound between LAUPT and points along UP's Coast Line
  - Daily Southwest Chiefs between LAUPT and points east via the former ATSF route through San Bernardino and Barstow
  - Thrice-weekly Sunset Limiteds between LAUPT and points east via the former SP line through Pomona, Ontario, and Palm Springs.
  - 20-22 daily Pacific Surfliners (formerly the San Diegans) between LAUPT and San Diego on the former ATSF line through Fullerton, Anaheim, Santa Ana, and Irvine. Some of these trains operate north of LAUPT on the former SP line to Santa Barbara.
- The long-distance Coast Starlights, Southwest Chiefs, and Sunset Limteds require one operating "slot" daily in each direction on their respective routes, and there are no announced plans to increase their frequency. While these trains do take up some of the total capacity on each route, they cannot be regarded as significant operating obstacles for future expansion of freight operations on the long-haul routes. In the vicinity of LAUPT, however, the impact is significantly greater, and is combined with the impact of the much more frequent Surfliners.
- The great frequency of the Surfliners, the possibility of expansion, and the wide operating windows required to keep them on schedule doe significantly limit the use of their route for rail freight service. BNSF operates several trains per day between Los Angeles and San Diego on the former ATSF route used by the Surfliners, and there is some reserve capacity.

Railroad Line Capacity

The major factors of railroad line capacity are the following:

- **Number of tracks** – double track generally allows trains to pass in opposite directions without stopping.
- **Number and length of sidings** – longer sidings on single or multiple track lines allow for longer trains and increase the likelihood that trains can avoid stopping when meeting or passing other trains.
- **Number of crossovers and other connections** – crossovers allow trains to use other tracks but also force trains to slow down.
- **Type of signaling** – Centralized Traffic Control is generally expected to yield the highest capacity but is not justified on low-volume routes. There are many types and variations of signaling systems.
- **Speed limits** – speed limits are determined both by track and route conditions and by the environment, including the presence of grade crossings, passenger stations, etc. Maintaining track standards for higher speeds is costly, and must be justified by capacity increase and traffic demand.
- **Grade and curvature** – to overcome steeper grades and tighter curves, trains require more power at any given tonnage and speed. As trains must slow down around tight curves or when descending steep grades, the number of trains that can pass through in a given time declines.
- **Traffic mix** – higher speed intermodal traffic will yield more trains, but lower speed unit trains of bulk commodities will yield more tonnage.

Railroad line capacity is not an exact science:

- Different “rules of thumb” result in different capacity estimates.
- Resourceful, dedicated managers can often operate their facilities at volumes beyond their estimated capacities.
- Poorly designed or indifferently managed facilities will become congested before their estimated capacity is reached.
- There is no simple measure of capacity, since railroads traffic is a mix of commodities and train types moving with different speeds and priorities.

Major Corridor Capacity

- There are no public data on the present or expected usage and performance of the private rail system. That is confidential to the two owners of the primary freight rail systems in the SCAG region, Burlington Northern Santa Fe and Union Pacific. Further the expected usage and performance is dependent on the commercial decisions made by the two companies. It is generally believed that the expected growth in rail intermodal service, primarily due to the projections for increased imports at the Ports of Los Angeles and Long Beach, will fill the existing capacity of both railroads within the LA Basin sometime before 2025. Hence, both companies face major decisions about the nature of the shipments that they will attempt to secure based on their individual service design plans and ability to raise capital to expand capacity.
- The high-capacity main routes leading to and from the SCAG region generally have the following characteristics:
  - Double track or long, frequent sidings.
  - Centralized Traffic Control
  - Well-spaced crossovers
  - Steep, twisting grades over mountain passes
- The railroads have invested in capacity-enhancing improvements, but are constrained by the geography: between the SCAG Region and the rest of North America are a series of mountain passes that constrain railroad capacity and performance.
  - The UP (former SP) Coast Line has steep grades at Cuesta, near San Luis Obispo.
  - The UP and BNSF lines through the Inland Empire pass through Cajon Pass.
  - The UP line to the southeast passes over Beaumont Hill.

Rail Network Limitations

- Geography imposes some serious limitations on the ability of the rail network to expand service.
  - Rail lines use mountain passes with steep grades and limited right-of-way.
  - Lines to the north and east cross Cajon and Beaumont Passes
  - Steep grades and tight curves reduce speeds, limit train lengths, and increase costs.
  - Narrow right-of-way shared with highways makes it difficult and costly for railroads to increase capacity.

Cajon Pass

Capacity and Traffic Growth

- In general the routes in the LA basin used by both services are 40 to 50 MPH tracks for freight, and higher for passenger. What may be required on these heavy service routes is construction of additional main tracks in order to increase capacity. In part this is already being planned for the segment of the BNSF between the LAUPT connection and Fullerton Junction, with new third and fourth main tracks to be added with construction completion scheduled for early 2003.
- For example currently the BNSF Cajon route east from San Bernardino hosts 90-95 train movements daily. If continued annual growth is conservatively estimated at three percent annually for the next five years, about three trains a day will be added on this route alone each year, or upwards of 110-115 a day or more , in the out years. While railroad personnel have reportedly operated as many as 115 trains a day, this has been in emergencies or under short term conditions. Capacity can do some extent be created by operating longer trains. This can be the case on the lower grade portions, however on the heavy mountain grades this is a more limited option.

Alameda Corridor

- The Alameda Corridor is a major infrastructure project involving consolidation of rail and truck traffic to and from the ports of Long Beach and Los Angeles onto a high-capacity right of way following Southern Pacific's former Alameda line. The Alameda Corridor itself is a 20-mile rail and truck corridor from the ports of Long Beach and Los Angeles to downtown Los Angeles. The railroad component involves consolidating the movements of Union Pacific, Southern Pacific (now part of Union Pacific), and Burlington Northern Santa Fe (the new entity formed by the BN-ATSF merger) onto an improved right of way parallel to Alameda Street purchased from Southern Pacific by the Alameda Corridor Transportation Authority (ACTA).
- The Alameda Corridor replaces three separate rail routes presently serving the Ports of Long Beach and Los Angeles. The Alameda Corridor project also includes widening and other improvements on the parallel highway and grade separations.
- From the rail perspective, the Alameda Corridor project will have three basic impacts:
  - Consolidating the port rail operations of UP/SP and BNSF on a single line
  - Improving intermodal rail efficiency compared to other modes
  - Facilitating the growth of on-dock transfer of containers between marine and rail modes
- The corridor will also stimulate increased port activity. Development of the Alameda Corridor is expected to encourage and facilitate the development of "on-dock" container transfer facilities at the ports, thereby reducing the need to dray containers over city streets and freeways (particularly Interstate 710) to and from rail intermodal terminals as much as twenty miles away.